PB-240 336

SARATOGA LAKE, SARATOGA COUNTY, NEW YORK

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center, Las Vegas
National Environmental Research Center, Corvallis, Oregon
New York National Guard
New York State Department of Environmental Conservation

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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REPORT
ON
SARATOGA LAKE
SARATOGA COUNTY
NEW YORK

EPA REGION II

WORKING PAPER No. 168

WITH THE COOPERATION OF THE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AND THE

NEW YORK NATIONAL GUARD

DECEMBER, 1974

CONTENTS

	Page
Foreword	ii
List of New York Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	10
V. Literature Reviewed	15
VI. Appendices	16

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the New York Department of Environmental Conservation for professional involvement and to the New York National Guard for conducting the tributary sampling phase of the Survey.

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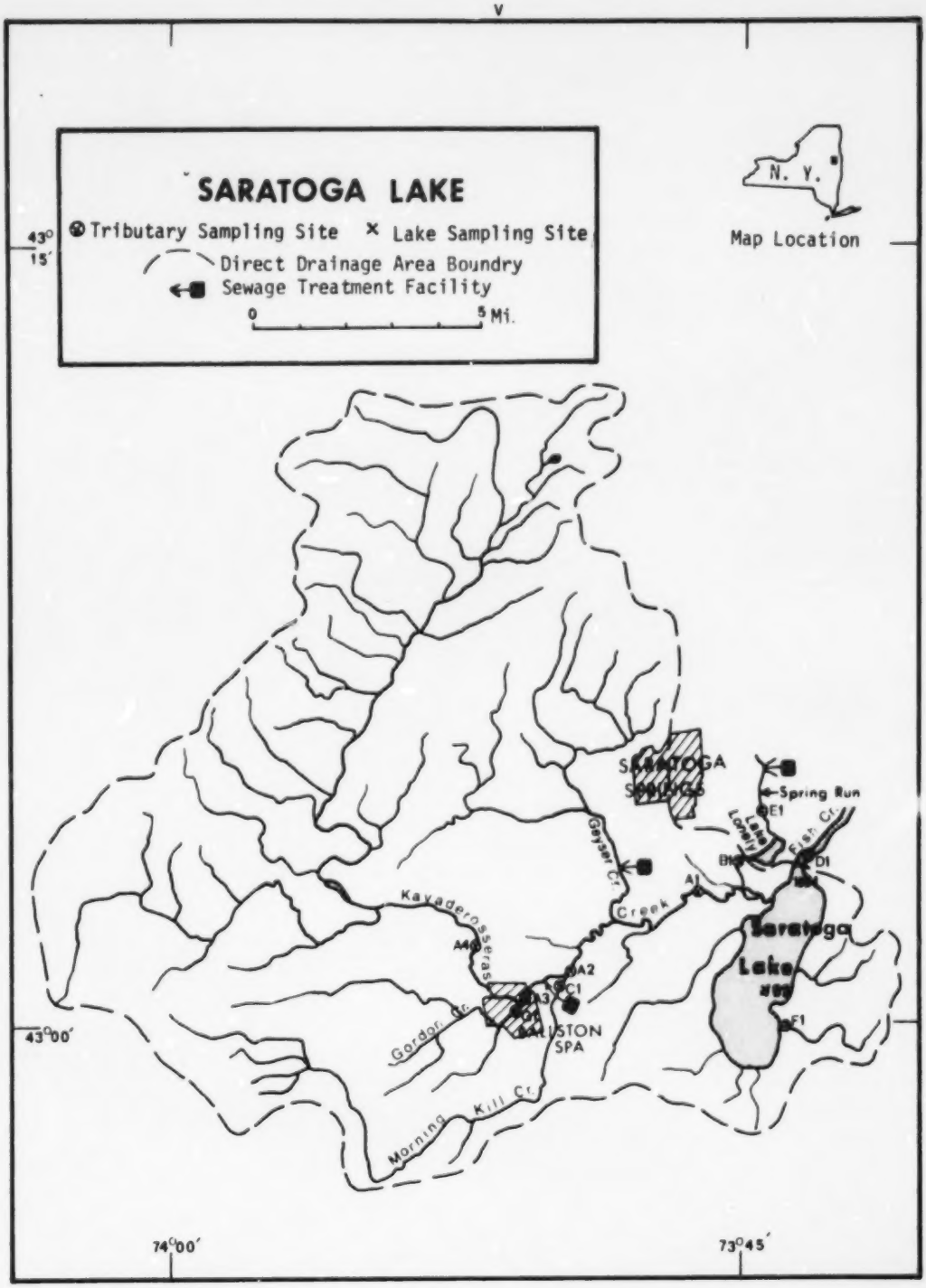
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW YORK

LAKE NAME	COUNTY
Allegheny Reservoir	Cattaraugas, NY; McLean, Warren, PA
Black	St. Lawrence
Canadaigua	Ontario
Cannonsville	Delaware
Carry Falls	St. Lawrence
Cassadaga	Chautauqua
Cayuga	Seneca, Tompkins
Champlain	Clinton, Essex, NY; Addison, Chittenden, Franklin, VT
Chautauqua	Chautauqua
Conesus	Livingston
Cross	Cayuga, Onondaga
Goodyear	Otsego
Huntington	Sullivan
Keuka	Ontario
Long	Hamilton
Lower St. Regis	Franklin
Otter	Cayuga
Owasco	Cayuga
Raquette Pond	Franklin
Round	Saratoga
Sacandaga Res.	Fulton, Saratoga
Saratoga	Saratoga
Schroon	Essex, Warren
Seneca	Seneca, Schyler, Yates
Swan	Sullivan
Swinging Bridge Res.	Sullivan


SARATOGA LAKE
Tributary Sampling Site
Lake Sampling Site
Direct Drainage Area Boundry
Sewage Treatment Facility
0
5 Mi.
N. Y.
Map Location
43° 15'
43°00'
74°00'
73°45'
Spring Run
E1
Fish Cr.
D1
Geyser Cr.
Kayaderosseras Creek
A1
A2
A3
C1
Saratoga Lake
F1
Gordon Cr.
Morning Kill Cr.

SARATOGA LAKE

STORET NO. 3633

I. CONCLUSIONS

A. Trophic Condition:

Survey data and the data of others (Coffey, 1974; et al.) indicate that Saratoga Lake is eutrophic. Of the 26 New York lakes sampled in the fall of 1972, when essentially all were well-mixed, 13 had less mean total phosphorus, 20 had less mean dissolved phosphorus, and four had less mean inorganic nitrogen. For all New York data, 17 lakes had less mean chlorophyll a, and 11 had greater Secchi disc transparency.

Survey limnologists noted that an algal bloom was in progress during the October, 1972, sampling period.

Despite the fact that some lake uses are impaired by algal blooms and aquatic plant growths, Saratoga Lake supports an excellent fish population which includes some 25 species, and the lake is heavily used for sport fishing purposes.

B. Rate-Limiting Nutrient:

The results of the algal assays show that the nutrient limiting primary production during the October, 1972, EPA sampling was nitrogen; this is substantiated by the nitrogen to phosphorus ratios observed in the field at that time. However, field data obtained during the May and July sampling suggest that phosphorus had been limiting earlier in the growing

season. This change in limiting nutrient with change in season has been observed in some other lakes surveyed (see discussion of algal assays on page 9).

An 80% reduction or total elimination of the phosphorus input from involved municipal sewage treatment plants should make phosphorus the limiting nutrient throughout the growing season.

C. Nutrient Controllability:

1. Point sources--The mean annual contribution of phosphorus from point sources was about 51% of the total reaching Saratoga Lake. Although Saratoga Springs discharges a larger amount of phosphorus than Ballston Spa, much of it is sedimented and/or biologically assimilated in Lonely Lake before reaching Saratoga Lake. These cities contribute about 43% of the total, while the Geyser Crest contribution is estimated at 8.1%.

The present phosphorus loading rate to Saratoga Lake is estimated to be 14.3 lbs/acre/ year or 1.6 g/m^2/year. This rate is about twice the "dangerous" rate (i.e., a eutrophic rate; see page 14) proposed by Vollenweider (in press).

Recent studies (France, 1973; Roetzer, 1973; Coffey, 1974; and Tuttle, 1974) confirm the conclusion that phosphorus loads to this lake should be reduced. Phosphorus reduction from point sources would require a 28,790 pound reduction in the

total load, i.e., complete diversion of sewage effluent would be necessary to reduce the loading rate to Vollenweider's "eutrophic" level.

If a reduction in nutrients at the above suggested level were achieved, the extent of alleviation of the undesirable lake conditions now experienced is not known at this time. However, past studies on other lakes have shown (Edmondson, 1972) or strongly suggested (Hetling and Sykes, 1973) that reduced nutrient loads would improve the trophic condition of culturally enriched lakes.

Estimates of total nutrient loadings and the evaluation of the cultural eutrophication of Saratoga Lake compares quite well with Coffey (1974). Coffey's estimates of nutrient loadings, 11.2 lbs/acre/yr or 1.26 $g/m^2/yr$ for phosphorus and 62.6 lbs N/acre/yr or 7.0 $g/m^2/yr$ for nitrogen, are slightly less than the estimates in this report. However, even a loading rate of 1.26 $g/m^2/yr$ of phosphorus is more than 1.5 times that proposed by Vollenweider as "dangerous".

2. Non-point sources--The mean annual contribution of phosphorus from non-point sources amounted to about 50% of the total load. Kayaderosseras Creek contributed almost 45%, and the unsampled drainage areas contributed 2%.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 4,032 acres.
2. Mean depth: 26 feet.
3. Maximum depth: 96 feet.
4. Volume: 104,832 acre/feet.
5. Mean hydraulic retention time: 150 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Kayaderosseras Creek	196.0 mi^2	282.9 cfs
Unnamed Creek (B-1)	20.6 mi^2	29.7 cfs
Spring Run	10.8 mi^2	15.6 cfs
Minor tributaries & immediate drainage -	10.3 mi^2	24.0 cfs
Total	237.7 mi^2	352.2 cfs

2. Outlet -

Fish Creek	244.0 mi^2**	352.2 cfs

C. Precipitation***:

1. Year of sampling: 50.9 inches.
2. Mean annual: 46.1 inches.

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† Aulenbach, 1973.
* Drainage areas are accurate within ±5%, except for small basins (±10%); mean daily flows are accurate within ±5 to 25%; and normalized mean monthly flows are accurate within ±15%.
** Includes area of lake.
*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Saratoga Lake was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from a number of depths at each station (see map, page v). During each visit, and also on May 9th, a single depth-integrated (15 feet or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll *a* analysis. The maximum depths sampled were 40 feet at station 1 and 51 feet at station 2.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (10/11/72)		
Temperature (Cent.)	12.4	14.7	14.9	15.1
Dissolved oxygen (mg/l)	4.2	8.0	8.4	8.8
Conductivity (µmhos)	233	238	238	243
pH (units)	7.2	7.7	7.8	7.8
Alkalinity (mg/l)	69	75	73	87
Total P (mg/l)	0.018	0.031	0.028	0.067
Dissolved P (mg/l)	0.011	0.020	0.016	0.049
NO_2 + NO_3 (mg/l)	0.040	0.071	0.060	0.240
Ammonia (mg/l)	0.040	0.082	0.075	0.230
		ALL VALUES		
Secchi disc (inches)	84	99	93	143

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
05/09/72	1. Dinobryon	741
	2. Fragilaria	488
	3. Navicula	262
	4. Melosira	172
	5. Nitzschia	163
	Other genera	425
	Total	2,251
05/15/72	1. Anabaena	2,206
	2. Fragilaria	759
	3. Cryptomonas	579
	4. Dinobryon	344
	5. Flagellates	325
	Other genera	868
	Total	5,081
07/25/72	1. Dinobryon	651
	2. Flagellates	542
	3. Tabellaria	410
	4. Cryptomonas	301
	5. Schroederia	217
	Other genera	385
	Total	2,506
10/11/72	1. Fragilaria	422
	2. Anabaena	339
	3. Cyclotella	279
	4. Flagellates	256
	5. Navicula	75
	Other genera	400
	Total	1,771

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/15/72	01	4.5
	02	3.4
07/25/72	01	12.6
	02	21.9
10/11/72	01	15.7
	02	12.9

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.042	0.189	7.5
0.010 P	0.052	0.189	6.8
0.020 P	0.062	0.189	6.1
0.050 P	0.092	0.189	6.5
0.050 P + 5.0 N	0.092	5.189	30.1
10.0 N	0.042	10.189	9.1

2. Filtered and Nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.021	0.182	3.7
0.010 P	0.031	0.182	4.2
0.020 P	0.041	0.182	4.2
0.050 P	0.071	0.182	3.0
0.050 P + 5.0 N	0.071	5.182	27.5
10.0 N	0.021	10.182	4.9

3. Discussion -

The control yield of the assay alga, Selenastrum capricornutum in the autoclaved and filtered sample indicates that nutrients present could support relatively high levels of primary productivity at the time the sample was collected.

The responses to spikes of phosphorus and nitrogen, added separately and in combination, indicate the Saratoga Lake productivity was limited by nitrogen at the time of sampling. This conclusion is substantiated by lake data, obtained at the same time, which indicate that the nitrogen-phosphorus ratio was less than 10 to 1 (i.e., nitrogen limitation would be expected).

Date obtained in May and July, however, suggest that productivity was limited by phosphorus at those times (N/P ratios were 19/1 or greater). This indicates that controlling phosphorus input alone would have a favorable affect on the trophic condition of the lake.

The phenomenon of change in limiting nutrient with change in season has been observed in other lakes in the Survey - most notably in Shagawa Lake in Minnesota which has been subjected to intensive study by EPA's National Eutrophication Research and Lake Restoration Branch.

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the New York National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May when two samples were collected. Sampling was begun in November, 1972, and was completed in October, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New York District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" (ZZ" of U.S.G.S.) were estimated by using the nutrient loads, in lbs/mi^2/year, at station A-4 and multiplying by the ZZ area in mi^2.

The operator of the Saratoga Springs wastewater treatment plant provided monthly effluent samples and corresponding flow data. Nutrient loads from the cities of Ballston Spa and Geyser Crest were estimated at 2.5 lbs P and 7.5 lbs N/capita/year.

Saratoga Springs wastewater treatment plant discharges into Spring Run Creek which flows to Lake Lonely. Nutrient samples were collected at

* See Working Paper No. 1.

two sites, B-1 and E-1 (see map, page v), both downstream from the Saratoga Springs STP. A considerable loss of phosphorus (65%) to Lake Lonely was observed, and the estimated mean annual phosphorus contribution at station B-1 is based on a percentage of the total expected from Saratoga Springs STP and areal sources. The nitrogen load at station B-1 was not adjusted.

A. Waste Sources†:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
Saratoga Springs	18,845	sand filter	2.802	Spring Run Creek
Ballston Spa	4,968	prim. clarifier	0.497*	Kayaderosseras Creek
Geyser Crest	1,869	extended aeration	0.187*	Geyser Creek

2. Known industrial - None

† Aulenbach, 1974.
* Estimated at 100 gal/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Kayaderosseras Creek	25,570	44.4
Unnamed Creek (B-1)	830	1.4
b. Minor tributaries & immediate drainage (non-point load) -	1,180	2.1
c. Known municipal STP's -		
Saratoga Springs	12,030	20.9
Ballston Spa	12,420	21.6
Geyser Crest	4,670	8.1
d. Septic tanks* -	190	0.3
e. Known industrial - None	-	-
f. Direct precipitation** -	630	1.2
Total	57,520	100.0

2. Outputs -

Lake outlet - Fish Creek 26,830

3. Net annual P accumulation - 30,690 pounds

* Estimate based on 297 lakeside dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Kayaderosseras Creek	459,340	58.1
Unnamed Creek (B-1)	122,640	15.5
b. Minor tributaries & immediate drainage (non-point load) -	10,230	1.3
c. Known municipal STP's -		
Sar toga Springs	101,030	12.8
Ballston Spa	37,260	4.7
Geyser Crest	14,020	1.8
d. Septic tanks* -	6,980	0.9
e. Known industrial - None	-	-
f. Direct precipitation** -	38,840	4.9
Total	790,340	100.0

2. Outputs -

Lake outlet - Fish Creek 609,390

3. Net annual N accumulation - 180,950 pounds

* Estimate based on 297 lakeside dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
Kayaderosseras Creek	115	993
Unnamed Creek (B-1)*	40	5,953

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	14.3	7.6	196.0	44.9
grams/m^2/yr	1.60	0.85	22.0	5.0

Vollenweider loading rates for phosphorus (g/m^2/yr) based on mean depth and mean hydraulic retention time of Saratoga Lake:

"Dangerous" (eutrophic rate)	0.82
"Permissible" (oligotrophic rate)	0.41

* Phosphorus loading adjusted; see page 10.

V. LITERATURE REVIEWED

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VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3633 SARATOGA LAKE

TOTAL DRAINAGE AREA OF LAKE 244.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3633A1	196.00	259.00	273.00	564.00	727.00	357.00	212.00	141.00	96.00	119.00	150.00	253.00	249.00	282.93
3633B1	20.60	27.20	28.70	59.30	76.40	37.50	22.30	14.80	10.10	12.50	15.80	26.60	26.20	29.74
3633D1	244.00	322.41	340.81	702.93	905.29	443.45	263.36	175.25	119.09	148.14	186.97	315.64	309.83	352.25
3633E1	10.80	14.30	15.10	31.10	40.10	19.60	11.70	7.77	5.29	6.56	8.26	14.00	13.70	15.60
3633Z7	16.60	22.00	23.20	47.80	61.60	30.20	17.90	11.90	8.13	10.10	12.70	21.50	21.10	23.98

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 244.00
SUM OF SUB-DRAINAGE AREAS = 244.00

TOTAL FLOW IN = 4233.00
TOTAL FLOW OUT = 4233.07

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3633A1	11	72	632.00	4	324.00				
	12	72	437.00	1	288.00				
	1	73	702.00	5	350.00				
	2	73	424.00	5	415.00				
	3	73	867.00	9	1050.00				
	4	73	709.00	7	1250.00	15	535.00		
	5	73	623.00	8	208.00	20	1140.00		
	6	73	312.00	5	231.00				
	7	73	191.00	9	102.00				
	8	73	78.40	5	70.00				
	9	73	76.50	6	86.00				
	10	73	84.50	8	59.80				
3633B1	11	72	66.50	4	56.70				
	12	72	46.00	1	50.50				
	1	73	73.70	5	61.30				
	2	73	44.50	5	72.00				
	3	73	91.20	9	182.00				
	4	73	74.60	7	165.00	15	54.00		
	5	73	65.40	8	24.00	20	140.00		
	6	73	32.80	5	27.00				
	7	73	20.00	9	13.80				
	8	73	8.25	5	8.50				
	9	73	8.04	6	10.30				
	10	73	8.90	8	7.35				

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3633 SARATOGA LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3633D1	11	72	815.00	4	613.00				
	12	72	561.00	1	545.00				
	1	73	902.00	5	652.00				
	2	73	546.00	5	770.00				
	3	73	1120.00	9	1940.00				
	4	73	912.00	7	1470.00	15	635.00		
	5	73	799.00	8	328.00	20	1360.00		
	6	73	400.00	5	360.00				
	7	73	245.00	9	190.00				
	8	73	100.00	5	90.00				
	9	73	98.40	6	123.00				
	10	73	109.00	8	70.00				
3633E1	11	72	35.00	4	29.60				
	12	72	24.00	1	26.40				
	1	73	38.80	5	32.20				
	2	73	23.40	5	37.80				
	3	73	47.80	5	41.80				
	4	73	39.10	7	42.80	15	26.40		
	5	73	34.20	8	16.00	20	40.20		
	6	73	17.20	5	17.40				
	7	73	10.50	9	9.50				
	8	73	4.32	5	8.20				
	9	73	4.22	6	9.80				
	10	73	4.66	8	7.20				
3633ZZ	11	72	54.00	4	41.70				
	12	72	37.00	1	37.10				
	1	73	59.60	5	45.00				
	2	73	36.00	5	53.10				
	3	73	73.50	9	135.00				
	4	73	60.10	7	78.00	15	39.70		
	5	73	52.70	8	21.70	20	73.00		
	6	73	26.30	5	23.70				
	7	73	16.10	9	13.20				
	8	73	6.64	5	7.54				
	9	73	6.49	6	9.57				
	10	73	7.16	8	6.26				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/11/26

363301
43 02 45.0 073 43 32.0
SARATOGA LAKE
36 NEW YORK

11EPALES
3

2111202
0053 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/15	11	35 0000	15.5	8.8	88	220	7.50	70	0.200	0.050	0.041	0.024
	11	35 0010	11.2	14.6		210	7.30	61	0.330	0.040	0.025	0.016
	11	35 0040	9.8	9.8		200	7.40	60	0.340	0.050	0.024	0.016
72/07/25	10	00 0000			98	220	8.50	69	0.030	0.040	0.020	0.010
	10	00 0004	27.3	9.0		230	8.80	70	0.030	0.050	0.015	0.010
72/10/11	09	00 0000			84	235	7.80	71	0.040	0.040	0.021	0.011
	09	00 0004	14.9	8.8		235	7.80	72	0.040	0.050	0.021	0.011
	09	00 0015	14.9	8.8		238	7.80	72	0.040	0.040	0.022	0.013
	09	00 0022	14.9	8.8		233	7.80	87	0.040	0.040	0.025	0.014
	09	00 0029	14.9	8.6		238	7.80	84	0.040	0.050	0.029	0.014

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/15	11	35 0000	4.5J
72/07/25	10	00 0000	12.6J
72/10/11	09	00 0000	15.7J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/11/26

363302
43 00 37.0 073 44 48.0
SARATOGA LAKE
36 NEW YORK

11EPALES
3

2111202
0020 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/18	12 15	0000	14.1	9.4	143	200	7.40	73	0.280	0.060	0.032	0.023
	12 15	0010	12.8	13.5		220	7.60	69	0.330	0.060	0.040	0.020
	12 15	0020	13.1	7.2		210	7.50	69	0.350	0.070	0.024	0.018
72/07/25	20 15	0000			98	220	8.20	72	0.030	0.030	0.011	0.008
	20 15	0004	25.8	8.6		220	8.10	71	0.040	0.040	0.014	0.009
	20 15	0010	25.1	7.4		220	7.80	70	0.490	0.650	0.019	0.010
	20 15	0025	19.0	2.2		225	7.30	69	0.140	0.220	0.027	0.017
72/10/11	09 30	0000			84	238	7.80	77	0.070	0.080	0.028	0.017
	09 30	0004	15.1	8.4		238	7.80	75	0.060	0.070	0.018	0.025
	09 30	0015	15.1	8.3		238	7.75	73	0.070	0.080	0.030	0.017
	09 30	0022	15.1	8.4		240	7.80	73	0.060	0.080	0.034	0.017
	09 30	0031	15.0	8.4		240	7.75	73	0.060	0.080	0.029	0.016
	09 30	0041	14.6	7.3		240	7.65	77	0.090	0.140	0.045	0.032
	09 30	0051	12.4	4.2		243	7.20	69	0.240	0.230	0.067	0.049

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/18	12 15	0000	3.4J
72/07/25	20 15	0000	21.9J
72/10/11	09 30	0000	12.9J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 74/11/26

3633A1 LS3633A1
43 02 30.0 073 46 30.0
KAYADEROSSERAS CREEK
36035 7.5 SARATOGA SPR
T/SARATOGA LAKE
BRDG E OF US HWY 87
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	10 05		0.143	0.440	0.050	0.020	0.055
72/12/01	13 10		0.340	0.350	0.063	0.026	0.042
73/01/05	11 00		0.400	0.520	0.071	0.013	0.030
73/03/09	09 45		0.330	1.260	0.044	0.012	0.230
73/04/07	09 10		0.252	0.640	0.270	0.005K	0.020
73/04/15	15 30		0.252	0.460	0.066	0.023	0.040
73/05/08	19 40		0.150	0.460	0.032	0.022	0.060
73/05/20	19 54		0.126	0.550	0.029	0.013	0.045
73/06/05	15 10		0.210	0.540	0.068	0.033	0.065
73/07/09	20 50		0.336	0.500	0.072	0.046	0.065
73/08/05	08 45		0.370	0.480	0.110	0.061	0.100
73/09/06	20 00		0.490	1.050	0.350	0.098	0.150
73/10/08	20 46		0.220	0.975	0.046	0.054	0.085

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3433A2 LS3633A2
43 01 00.0 073 49 30.0
KAYADEROSSERAS CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
NORTHLINE RD BRDG BELO BALLSTON SPA STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 45		0.126	1.050	0.140	0.025	0.052
72/12/01	13 20		0.330	0.500	0.092	0.027	0.058
73/01/05	11 50		0.420	0.460	0.091	0.015	0.033
73/03/09	09 34		0.320	1.320	0.077	0.013	0.260
73/04/07	09 00		0.240	0.760	0.115	0.005K	0.030
73/04/15	15 10		0.220	1.890	0.154	0.034	0.090
73/05/08	20 20		0.120	0.630	0.072	0.029	0.060
73/05/20	21 04		0.147	0.800	0.046	0.013	0.045
73/06/05	15 00		0.198	0.605	0.150	0.058	0.095
73/07/09	23 35		0.126	0.460	0.154	0.046	0.075
73/08/05	09 35		0.220	0.900	0.280	0.120	0.185
73/09/06	22 25		0.200	1.100	0.292	0.105	0.183
73/10/08	22 30		0.069	2.940	0.390	0.180	0.570

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3633A3 LS3633A3
43 00 30.0 073 50 30.0
KAYADEROSSERA CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
BRDG IN BALLSTON SPA ABOVE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 30		0.089	0.380	0.026	0.009	0.028
72/12/01	13 30		0.250	0.220	0.012	0.012	0.021
73/01/05	10 40		0.300	3.150	0.180	0.007	0.015
73/02/05	12 55		0.252	0.260	0.031	0.011	0.035
73/03/09	09 27		0.290	1.280	0.063	0.010	0.170
73/04/07	08 50		0.220	0.630	0.054	0.007	0.035
73/04/15	14 50		0.140	1.680	0.044	0.005K	0.015
73/05/08	20 45		0.110	0.600	0.013	0.006	0.130
73/05/20	22 10		0.095	0.840	0.032	0.007	0.025
73/06/05	14 35		0.042	0.360	0.020	0.011	0.020
73/07/09	23 45		0.096	0.920	0.028	0.015	0.045
73/08/05	09 20		0.140	0.320	0.036	0.015	0.040
73/09/06	20 20		0.150	0.760	0.120	0.019	0.100
73/10/08	21 20		0.019	0.380	0.088	0.018	0.045

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3633A4 LS3633A4
43 01 00.0 073 52 00.0
KAYADEROSSERAS CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
GALWAY RD BRDG NW OF BALLSTON SPA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 10		0.093	0.400	0.040	0.008	0.026
72/12/01	13 50		0.220	0.150	0.012	0.009	0.020
73/01/05	10 15		0.252	0.405	0.031	0.005K	0.012
73/02/05	12 40		0.240	0.250	0.030	0.008	0.025
73/03/09	09 15		0.273	0.760	0.044	0.007	0.110
73/04/07	08 30		0.220	0.610	0.164	0.005K	0.015
73/04/15	14 30		0.154	1.720	0.058	0.006	0.015
73/05/08	20 50		0.120	1.070	0.027	0.014	0.037
73/05/20	21 20		0.100	0.520	0.052	0.008	0.030
73/06/05	14 15		0.078	0.320	0.010	0.005K	0.025
73/07/09	22 05		0.138	0.210	0.012	0.014	0.035
73/08/05	09 00		0.170	0.310	0.034	0.018	0.045
73/09/06	20 30		0.160	0.500	0.036	0.020	0.085
73/10/08	22 35		0.017	0.250	0.028	0.022	0.050

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3633R1 LS3633R1
43 03 00.0 073 45 00.0
UNNAMED CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
CRESCENT AVE BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	10 20		0.270	3.000	1.900	0.370	0.630
72/12/01	13 30		0.375	1.6	1.040	0.359	0.400
73/01/05	11 05		0.550	1.300	0.630	0.115	0.148
73/02/05	13 55		0.720	1.380	0.950	0.088	0.140
73/03/09	09 51		0.520	1.150	0.475	0.042	0.120
73/04/07	09 25		0.600	2.310	0.410	0.097	0.155
73/04/15	15 40		0.590	2.700	0.690	0.147	0.230
73/05/08	19 35		0.520	2.000	0.490	0.138	0.185
73/05/20	19 50		0.140	0.580	0.036	0.029	0.060
73/06/05	15 20		0.231	1.050	0.330	0.130	0.170
73/07/09	20 45		0.120	1.890	0.635	0.168	0.220
73/08/05	10 00		0.072	1.500	0.069	0.027	0.160
73/09/06	20 55		0.210	1.500	0.500	0.110	0.185
73/10/08	20 40		0.260	1.900	0.840	0.189	0.240

STORET RETRIEVAL DATE 74/11/26

3633C1 LS3633C1
43 01 00.0 073 50 00.0
MORNING KILL CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
ALONG BANK FROM MALTA AVE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 40		0.190	0.670	0.147	0.008	0.042
72/12/01	13 25		0.700	0.520	0.260	0.007	0.019
73/01/05	10 45		0.980	0.350	0.092	0.005K	0.008
73/04/07	08 55		0.540	0.860	0.360	0.005K	0.030
73/04/15	15 00		1.000	0.830	0.310	0.008	0.025
73/05/08	19 22		0.440	0.750	0.078	0.016	0.057
73/05/20	20 58		0.260	0.690	0.044	0.012	0.045
73/06/05	14 50		1.160	1.050	0.340	0.019	0.035
73/07/09	23 30		0.880	1.500	0.750	0.052	
73/08/05	09 15		0.240	0.460	0.038	0.005K	0.020
73/09/06	21 40		1.000	1.300	0.500	0.022	0.065
73/10/08	22 10		0.790	1.600	0.328	0.014	0.050

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

363301 LS363301
43 04 30.0 073 42 00.0
FISH CREEK
36 7.5 QUAKER SPR
T/SARATOGA LAKE
AT STAFFORDS BRDG
11EPALES
4
2111204
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	11 20		0.135	0.660	0.134	0.03A	0.05A
72/12/01	12 00		0.210	0.975	0.13A	0.031	0.050
73/01/05	11 15		0.310	0.460	0.110	0.028	0.032
73/02/05	13 30		0.340	0.460	0.140	0.029	0.040
73/03/09	10 13		0.310	1.440	0.063	0.015	
73/04/07	09 55		0.231	0.460	0.048	0.005K	0.030
73/04/15	16 10		0.240	0.500	0.042	0.005K	0.025
73/05/08	19 25		0.147	0.420	0.03A		0.040
73/05/20	19 40		0.189	0.400	0.027	0.012	0.025
73/06/05	15 40		0.067	0.540	0.026	0.007	0.035
73/07/09	20 35		0.016	1.000	0.037	0.014	0.035
73/08/05	10 15		0.018	0.690	0.017	0.005K	0.030
73/09/06	17 20		0.032	1.200	0.052	0.023	0.080
73/10/08	20 30		0.050	0.820	0.048	0.005K	0.020

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3633E1 LS3633E1
43 04 00.0 073 44 30.0
SPRING RUN
36 7.5 QUAKER SPR
T/SARATOGA LAKE
ST HWY 9P BELO SARATOGA STP
11FPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	10 30		0.810	4.000	2.100	0.390	0.860
72/12/01	12 15		1.060	3.280	1.580	0.200	0.542
73/01/05	11 20		1.340	1.890	0.780	0.042	0.220
73/02/05	13 45		1.200	2.900	1.300	0.100	0.330
73/03/05	10 00		0.800	3.200	0.880	0.072	0.500
73/04/07	09 40		1.040	2.000	0.640	0.170	0.345
73/04/15	16 00		0.870	5.000	1.790	0.357	0.930
73/05/09	19 15		0.530	4.300	2.300	0.600	1.100
73/05/20	19 30		0.740	2.700	1.400	0.390	0.735
73/06/05	15 30		0.220	6.400	2.900	0.705	1.570
73/07/09	20 30		0.550	3.360	1.600	0.176	0.450
73/08/05	10 15		0.370	4.100	2.100	0.270	0.950
73/09/06	17 30		0.890	3.790	1.900	0.132	0.735
73/10/08	20 20		0.280	5.700	5.650	0.280	1.050

STORET RETRIEVAL DATE 74/11/26

3433F1 LS3633F1
43 00 00.0 073 44 00.0
UNNAMED CREEK
36 7.5 MECHANICSVIL
T/SARATOGA LAKE
ST HWY 9P HRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	11 40		0.047	1.320	0.157	0.008	0.019
72/12/01	11 45		0.390	0.400	0.023	0.010	0.023
73/01/05	12 20		0.550	0.400	0.028	0.005K	0.018
73/02/05	14 50		0.400	0.460	0.046	0.013	0.040
73/03/09	10 00		0.440	1.500	0.096	0.021	
73/04/07	10 10		0.160	0.420	0.016	0.005K	0.015
73/04/15	16 25		0.120	2.100	0.070	0.006	0.020
73/05/08	19 50		0.110	1.890	0.038	0.018	0.170
73/05/20	20 04		0.096	0.550	0.021	0.019	0.035
73/06/05	16 00		0.126	0.540	0.039	0.010	0.035
73/07/09	21 15		0.176	0.510	0.040	0.021	0.030
73/08/05	11 10		0.072	0.340	0.028	0.017	0.030
73/09/06	19 25		0.294	0.960	0.138	0.023	0.090
73/10/04	21 10		0.028	0.450	0.170	0.029	0.090

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3633G1 LS3633G1
43 00 30.0 073 51 00.0
GORDON CREEK
36 7.5 SARATOGA SPR
T/SARATOGA LAKE
ST HWY 50 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 20		0.084	0.840	0.054	0.012	0.044
72/12/01	13 45		0.330	0.200	0.016	0.006	0.018
73/01/05	10 30		0.410	0.420	0.036	0.006	0.008
73/02/05	12 50		0.302	0.240	0.031	0.009	0.035
73/03/09	09 23		0.273	1.320	0.098	0.023	
73/04/07	08 40		0.140	0.630	0.011	0.005K	0.015
73/04/15	14 40		0.231	2.200	0.100	0.005K	0.030
73/05/09	20 50		0.147	1.380	0.017		
73/05/20	20 29		0.120	1.200	0.040	0.010	0.025
73/06/05	14 25		0.210	0.620	0.069	0.009	0.020
73/07/09	23 20		0.220	0.580	0.034	0.015	0.035
73/08/05	08 45		0.014	3.200	0.120	0.010	0.035
73/09/06	21 00		0.300	0.630	0.058	0.009	0.045
73/10/08	23 00		0.126	0.380	0.132	0.008	0.015

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/27

363350 SF363350 P016000
43 05 30.0 073 46 00.0
SARATOGA SPRINGS
36035 7.5 QUAKER SPRNG
T/SARATOGA LAKE
SPRING RUN
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
72/12/28	11 30		0.370	9.962	3.000	0.354		2.500	2.690
73/01/31	13 00		0.680	11.500	3.100	1.160	4.000	2.000	2.700
73/03/05	13 00		0.490	14.700	5.300	1.700	4.500		
73/03/30	09 00		0.360	12.600	2.[illegible]90	1.690	4.750	2.000	2.000
73/05/01	13 00		0.165	13.200	3.200	2.900	5.600		2.100
73/06/01	14 00		0.100	23.100	2.800	3.600	5.000		2.100
73/07/02	09 00		0.170	8.650	0.053	1.380	2.900	2.800	2.600
73/08/01	13 00		0.710	11.500	3.360	1.600	4.400	2.900	3.700
73/09/04	10 30		0.290	13.200	3.595	2.650	4.000	3.100	2.600
73/10/03	13 00		0.440	13.500	4.100	2.200	5.150	3.150	3.230
73/11/06	13 00		1.000	12.500	2.310	1.400	3.400		3.500
73/12/03	13 00		0.440	15.500	5.200	1.680	4.500		3.100
74/01/05	13 30		0.600	9.900	1.520	1.360	3.000	2.800	2.900

STORET RETRIEVAL DATE 74/11/27

363550 PD363550 P005770
42 39 30.0 077 02 00.0
PENN YAN
36 7.5 PENN YAN
T/SENECA LAKE
KEUKA OUTLET
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	03630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/17	11 00								
CP(T)- 73/01/17	16 00		4.600	12.000	2.700	3.400	4.200	1.050	1.200
73/02/20	08 00								
CP(T)- 73/02/20	16 00		2.600	12.600	1.100	3.700	5.400	1.050	1.160
73/03/19	08 00								
CP(T)- 73/03/19	16 00		2.400	12.600	0.345	2.200	3.400	1.920	1.600
73/06/27	08 00								
CP(T)- 73/06/27	16 00		4.900	11.000	1.680	3.400	4.400	1.300	1.000
73/07/25	08 00								
CP(T)- 73/07/25	16 00		0.020	24.000	9.300	4.700	5.600	0.740	0.800
73/08/20	08 00								
CP(T)- 73/08/20	16 00		3.100	22.000	16.200	5.200	6.200	0.700	0.675
73/09/21	08 00								
CP(T)- 73/09/21	16 00		0.088	11.500	8.500	4.200	4.800	0.700	0.800
73/10/23	08 00								
CP(T)- 73/10/23	16 00		2.000	38.000	13.000	6.650	7.000	0.660	0.650
73/12/12	08 00								
CP(T)- 73/12/12	16 00		3.600	15.500	2.900	3.100	3.650	0.730	0.620
74/01/22	08 00								
CP(T)- 74/01/22	16 00		2.000	15.500	3.800	2.520	3.800	1.290	0.850
74/02/25	08 00								
CP(T)- 74/02/25	16 00		2.400	12.000	0.830	1.650	5.250	1.330	1.200
74/03/18	08 00								
CP(T)- 74/03/18	16 00		1.840	13.500	2.300	2.100	3.250	1.110	1.300